THERMAL EFFECTS OF PARTICLE FALLOUT AND CONDENSATION ON EXPLOSIVE; FRUP-l"lON PLUMES

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A model of first order differential equations has been developed to describe two-component buoyant plumes based on the entrainment assumption proposed by Morton *et al.* (1956) stating that the rate of entrainment of ambient is proportional to the bulk upward velocity of the plume. Two models are presented: onc for a water vapor plume containing particles and one for a vapor plume with condensation. Each of the two-component models also considers the effects due to the fallout of particles or water droplets. A three-component model combining water vapor condensation, particle fallout and rainout of water droplets is also presented.

Glaze and Baloga (1993) showed that buoyant plumes are sensitive to the thermal balance of the system due to the small density difference between the plume and the ambient. The condensation of water vapor to form liquid droplets involves the release of latent heat and an increase in density. We show that the condensation of only magmatic water vapor does not produce an appreciable difference in plume height. However, the condensation of entrained water vapor from a *wet* atmosphere can cause a plume to rise much higher than those released under *dry* conditions.

We also investigate the thermal effects of allowing particles and water droplets to be removed from the plume system. The fallout of these particles and droplets results in a loss of mass from the system, and thus a loss in momentum and the bulk plume's capacity to carry heat.

Glaze and Baloga (1993) *J. Geophys. Res., sub judice.*
Morton *et al.* (1956) *Proc. Roy. Sot. Lond.* A234: 1-23.